SCIENCE

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THE TIME-RELATIONS OF MENTAL PHENOMENA.

[Continued from p. 150.]

Association Times.

WHILE the effect of the association between stimulus and movement upon the time of the re-action has been already discussed, the process of association forms so important a factor in our mental life, that it requires a more specialized and independent investigation.

(1) *Questions with but a Single Answer.* We may view an adaptive re-action under the aspect of a "question and answer;" the stimulus being equivalent to the question, "What, with regard to certain points, is this impression?" and the answer, whether indicated by a name, or word, or movement, is given in the re-action. Our problem is to investigate the time-relations of these questions and answers, as an index of the readiness of the association between the two. The processes intervening between the appreciation of the question and the formulation of the answer may vary greatly in complexity and character. A common characteristic of the re-actions hitherto regarded consisted in the fact that the material for forming the answer is simply and directly supplied by the stimulus itself: it is in the main a verdict regarding the particular nature of sensation then present. The re-actions to which we now pass all include something more than this; and the formulation of the answer involves to a greater or less extent more complicated forms of mental activity, and depends more or less upon the past experiences, the special habits and tendencies of mind, of the individual.

While the line of division between the direct appreciation and the indirect interpretation of a sense-impression cannot be rigidly drawn, and while it is no less difficult to decide what processes are involved in this interpretation and elaboration of the sense-impression, yet we may with sufficient precision mark out as the first class of associations (*a*) those in which *a simple act of memory* plays the chief *rôle*. Thus, when Cattell, instead of naming a picture in his own language (which he does in 545σ), names it in German (in 694σ), the difference in time is needed for calling to mind the German name, and measures the strength of this association. Berger's acquaintance with English is less than Cattell's with German, and accordingly with him the difference between naming a picture in the vernacular and in a foreign language is greater (477σ and 649σ). The translation of a short familiar word from English to German occupies Cattell 686σ; from German to English, but 580σ; the time for long and less familiar words being much longer (we may obtain the portion of the time required for the act of translation alone by subtracting from this the time to see and name a word, 428σ). Such operations as addition and multiplication, when confined to numbers of one place, can hardly be more than acts of memory. Cattell adds such numbers in 336σ; Berger, who is a mathematician, in 221σ. The former multiplies them in 544σ; the latter, in 389σ. Vintschgau's three subjects multiply such numbers (though under different conditions) in 233σ. More complicated types of "memory re-actions" have been performed by Cattell and by Münsterberg. The former determined in separate series the time necessary, when given a city, to name the country in which it was situated (462σ); when given a month, to name the season to which it belongs (310σ), to name the following month (389σ), to name the preceding month (832σ); given an author, to name the language in which he wrote (350σ); given an eminent man, to name his sphere of activity (368σ). Münsterberg constantly varied the type of question including such as the above, the position of cities, the qualities of objects, the relations of men, and many others, finding an average time of 848σ (average of two subjects). While many of these determinations are doubtless of more individual than general value, we may stop to note a few points that are presumably typical. The re-actions here grouped under one class vary considerably in difficulty, and a few instances may be cited to indicate the range of this variation. In giving a country in which a given city is situated, the shortest time is for Paris (278σ); the longest, for Geneva (485σ). In giving the language in which an author wrote, Berger requires least time for Luther (227σ) and Goethe (265σ), most for Bacon (565σ); Cattell, least for Plato (224σ) and Shakspeare (258σ), most for Plautus (478σ). In giving the calling of an eminent man, the least time is required for poets (291σ), the longest for men of science (421σ). Münsterberg mentions as quickly answered questions (400σ to 600σ), "On what river is Cologne?" "In what season is June?" "In what continent is India?" as questions requiring a long time (1100σ -1300σ), "Who is the author of Hamlet?" "What is the color of ice?" "Who was the teacher of Plato?" An influence which we have found of great significance hitherto is equally important here; viz., the foreknowledge of the subject of what is to occur. In Cattell's experiments the general question is virtually asked once for the entire series, the special terms being given in each experiment, while in Münsterberg's results the entire question changes with each observation; and this difference in the expectancy of the subject cannot but be an important factor in the longer times found by the latter. A

somewhat different phase of this influence appears in the results of Vintschgau. In multiplying the numbers from 1×1 to 9×9, the smaller number was always announced first. Accordingly, when the first nine was announced, the subject practically anticipated the result, and had the product ready; when eight was announced, he knew that it was one of two results; when seven, one of three; and so on. Accordingly we find these to be the shortest processes (9×9, only 160σ); but there is another factor at work counteracting this effect, viz., the familiarity of certain multiplications, making the products by *one* short, and those by four and five long.

(*b*) The next type of "question and answer" will be one in which, in addition to the act of memory, a *comparison*, or a *judgment*, is involved. The result of the comparison, though not always the same for all individuals (and in this sense the question is not limited to a single answer), will probably always be the same in the same individual. The only experiment of Cattell's that seems properly to belong here is that in which the subject decided which was the greater of two eminent men (558σ). Münsterberg finds the average time for answering a miscellaneous group of such comparisons 947σ, or 99σ longer than the process without comparison: comparisons rapidly made (600σ–800σ) being, "Which has the more agreeable odor,—cloves or violets?" "Who is greater,—Virgil or Ovid?" "What is more beautiful,—woods or mountain?" and difficult questions (1200σ–1500σ) being, "Which is healthier,—swimming or dancing?" "Which do you like better,—Goethe's drama or his lyric?" "Which is more difficult,—physics or chemistry?" The comparison may be among more than two objects. Thus, in asking which is the finest of Goethe's dramas, the process of formulating the reply may include the calling to mind what the various dramas are, and a choice among them; not, of course, a considerate judgment, but the selection, under the necessity of an immediate answer, of one deciding motive. On the other hand, among the several possibilities, a certain one may, by habitual association or for other reasons, have become so prominent that virtually no comparison ensues; and the relatively slight excess in time of this type of association above the former ones (1049σ) suggests that this was often the case. To decide which is the pleasantest odor (rose), or which the most important German river (Rhine), required only between 600σ and 700σ; to decide which was the most difficult Greek author (Pindar), or your favorite French writer (Corneille), from 1400σ to 1600σ.

Münsterberg has ingeniously modified this form of experiment to show the influence of the foreknowledge or preparedness of the subject. He precedes the asking of the question by a dozen or so words of the category within which the comparison is to be made. Thus, "Apples, pears, cherries, peaches, plums, grapes, strawberries, dates, figs, raisins: which do you like better,—grapes or cherries?" Although the comparison cannot be begun until the last word is heard, still the subject has in a way anticipated the general nature of the question, as well as the scope of the comparison, and has reduced the time considerably (676σ, as compared with 947σ),—certainly a striking result.

(2) *Questions with More than a Single Answer.* In the class of re-actions to which we now pass, the question admits of several answers. The answer at one time may and need not be the same as at another time; and the determining factors in the particular character of the answer are the peculiar mental habits and tendencies of the individual. The question thus changes from a specific to a general one, the answer being any member of a more or less extended class answering to such and such a description. In some the choice may be somewhat limited. This is true of Cattell's experiments in which, given a country, we are to name a city in it (346σ); given a season, to name a month in it (435σ); given a language, to name an author writing in that language (519σ); or, given an author, to name any work of his (763σ). In all these cases we are apt to have in mind only a very few prominent instances under each head among which individual preference is exercised. In the following series the classes are more general, and accordingly the scope for individual preference much larger: given a general term to name a particular instance under that term (537σ); given a picture to name some detail of it (447σ); given the word instead of the picture, to make a similar association (439σ); given the picture or the name to mention some property of it (372σ and 337σ); given a quality to name an object to which it can be applied (351σ); given an intransitive verb to find an appropriate subject (527σ), or a transitive verb to find an appropriate object (379σ). Münsterberg has a series including a miscellaneous collection of such re-actions, and finds a time of 1036σ. Trautscholdt has investigated a similar series in which a specific instance of a general term had to be given, and finds a time of 1020σ (average of three subjects), 155σ of which must be deducted to get the pure association time.

Here, again, we may stop to consider a few generalizations which these results seem to sustain. The processes involved vary very considerably in the different experiments. Münsterberg cites as quick responses (450σ–600σ) the instancing of "a German wine (Rüdesheimer)," "of a number between ten and four (six)," "of a Greek poet (Homer);" as slow ones (1200σ–1500σ), "a beast of the desert (lion)," "a French author (Voltaire)." Trautscholdt names "mast" as "a part of a ship" in 391σ, but requires 1899σ to name "art" as "an æsthetic activity of man." These differences should appear in the average variations; that is, the average divergence of the re-action times from their mean. When the process is simple and constant, the average variation is small; when the processes are complicated and variable, the average variation is large. While in simple re-actions it is often less than 10 per cent of the re-action time, it is not infrequently as high as 30 per cent in the re-actions just considered. It may have been noticed that in certain cases the process in (2) was the reverse of that in (1). The one was a step from the whole to the part, the general to the special; while the other was from the part to the whole, the special to the general. In Cattell's case the former is the longer (433σ and 374σ). In Trautscholdt's results the conclusion comes out more clearly, the pure association time of an association of part to whole is 608σ; of whole to part, 901σ; of special to general, 754σ; of general to special, 947σ. It is thus easier to refer an individual object or quality to its class than to give an instance of a general concept. A similar result (namely, that the bond of association between two concepts is not equally strong in both directions) is derived from observing that it takes longer to recall that May precedes June than

that June follows May, longer to go back and find a subject for a verb than to go forward and find an object for it, longer when given a quality to find an object possessing that quality than to recall a quality for an object, and so on.

We may here also conveniently consider the overlapping of mental processes, which we have found takes place whenever a series of simple processes, or a complex process involving many simple ones, is performed. The general truth that the time of a complex mental operation is less than the sum of the times needed for the performance of the separate factors into which the former may be resolved, will be again illustrated Thus Münsterberg finds that it takes 103σ to name a specific instance of a class (e.g., to name a German river), 992σ to make a comparison, (e.g., Which is more important, — this river or that?) but only 1049σ to decide both questions together (e.g., Which is the most important German river?) In this case we clearly recognize that the last processes are not the sum of the preceding two, but that the category "most important German river" is already formed in the mind. The following comparisons are more illustrative. Instead of asking first, "Which is the most important German river?" (1049σ,) and then, "Which lies more westerly, — Berlin, or the most important German river?" (992σ,) we ask at once, "Which lies more westerly,— Berlin, or the most important German river?" and find the time 1855σ, or 176σ less than the sum of the two foregoing processes. Similarly, if instead of asking first, "On what river is Cologne situated?" (848σ,) and then, "Which is more westerly, — the Rhine or Berlin?" (992σ,) we ask at once, "Which is more westerly, — Berlin, or the river on which Cologne is situated?" we find a more remarkable saving of time (1314σ, or 526σ less than the sum of the two questions). This time was still further reduced to 1149σ when the question was preceded by a list of a dozen cities.

(3) *Unlimited Associations.* When we pass to the re-action of naming as rapidly as possible any word whatever, that is suggested by a given word, we are drawing entirely upon the natural associative habits of the individual, and accordingly this method has been most useful in studying psychological habits and tendencies. Our present purpose, however, is only with the time-relations of this unrestricted association. This has been the type of association first and most frequently investigated, and it is customary to speak of the pure association time as the total time minus the time needed to repeat a word. Thus Münsterberg repeats a word in 382σ, and calls out a word in association with the given word in 896σ. Trautscholdt, however, who experimented upon Wundt, Stanley Hall, and two other subjects, finds an average time of 1024σ, 727σ of which is regarded as the pure association time. Galton and others have made estimates, by rougher methods, of the rapidity with which trains of ideas pass through the mind, and the result is a rate not differing much in either direction from one association per second. It will be recognized at once that this process will be very different in different individuals and with different words. Münsterberg's shortest association was "gold–silver" (390σ); the longest, "sing–dance," "mountain–level" (1100σ–1400σ). Trautscholdt also found "gold–silver" a very quick re-action (402σ), "storm–wind" (368σ), "duty–right" (415σ). Long re-actions were "God–fearing" (1132σ), "throne–king" (1437σ), "Karl–August" (1662σ). Some interesting inferences result from the consideration of the times of different types of these unrestricted associations. Trautscholdt divides these into "word associations," or those suggested by the word rather than by the thing; "outer associations," or those relating to the sense-qualities of the object; and "inner" or logical associations. The results were 1033σ, 1028σ, 989σ, though this order may be liable to individual differences. Cattell and Berger have also compared the re-action times to concrete nouns (374σ, pure association time), to less concrete nouns (462σ), to abstract nouns (570σ), and to verbs (501σ), clearly showing that concrete terms are more readily suggestive than abstractions, and concrete objects more so than actions. Trautscholdt finds for associations to concrete nouns, 710σ; to actions, 837σ; to abstractions, 871σ.

Many of the influences to which we found simpler forms of re-action times open, are doubtless true of association times, but the great variability of the latter makes these difficult to establish. The effect of practice is noticed by Trautscholdt; and Cattell has shown that in students from thirteen to eighteen years of age a distinct shortening of the association time accompanies growth and education, while the students ranking higher in class have a somewhat shorter time than those standing low in class. Fatigue very readily enters, the accessible associations are easily exhausted, and the mind repeats itself very markedly. Changes under the action of drugs and in morbid mental states have been incidentally noticed, but still await systematic investigation.

The various processes, the times of which we have been studying, by no means exhaust the possibilities in this field. As our knowledge of mental operations becomes more perfect and more capable of experimental study, and as our power of analysis makes similar progress, the study of the time-relations of mental phenomena, already fertile in suggestions and results, will increase in interest and importance. JOSEPH JASTROW.

MODERN EXPLOSIVES AND FLUID FUELS.[1]

SIR FREDERICK ABEL commenced with a reference to the great names in art and science which Leeds could claim as its own. He next proceeded to refer to the advances made in electrical science and its application to industrial purposes; dealing with the history of the subject since the association last met in Leeds, in 1858, and bringing it to the present day by a reference to the scheme now on foot for utilizing the power of the Falls of Niagara, electric welding, and electric smelting, the latter in connection with the production of aluminium alloys. The influence of manganese, chromium, aluminium, nickel, etc., in the manufacture of steel, was also touched upon in the address.

It was, however, when the president reached that part of his speech in which he dealt with the appliances of war, that his audience felt they had reached the most important part of his address. He traced the history of the application of gunpowder from early days, and showed how great had been the advance since the last meeting in Leeds, but more especially in quite recent times. When Sir Frederick first actively turned his attention to the subject, Doremus, in America, had proposed the employment in heavy guns, of charges consisting of large pellets of prismatic form. This powder was first used in Russia. The subject was followed up in England, Germany, and Italy. The researches of the Government Committee on Explosives, in which, as is well known, Sir Frederick and Capt. Noble took the leading part, were

[1] Abstract of an address delivered at the annual meeting of the British Association for the Advancement of Science at Leeds, Eng., by the president, Sir Frederick Abel.

also referred to at some length. The "cocoa" powder was produced, which is a prismatic powder containing a very slightly burned charcoal of reddish-brown color, the action of which is comparatively gradual and long sustained. The smoke from this differs but little in volume from that of black powder, but disperses much more rapidly. Even more gradual action yet was required in the case of guns of large caliber, and the brown powder has been modified to meet the case. The desirability of producing a smokeless powder has led many to attempt the use of ammonium nitrate, in which the products of decomposition are, in addition to water-vapor, entirely gaseous. Its deliquescent character has, however, been a formidable obstacle to its application as a component of a useful explosive agent. An ammonium-nitrate powder has, however, been manufactured in Germany which possesses remarkable ballistic properties, and produces comparatively little smoke, which speedily disperses. No great tendency is exhibited by it to absorb moisture from an ordinarily dry, or even somewhat moist, atmosphere; but it readily absorbs water when the hygroscopic condition of the air approaches saturation, and this greatly restricts its use. Sir Frederick next referred to the introduction in France of melinite; but this has now been succeeded by more than one smokeless powder, and the material now in use with the Lebel rifle belongs to a class of nitro-cellulose, or nitro-cotton preparation.

A comparison between the chemical changes attending the burning or explosion of gunpowder, and of the class of nitro-compounds represented by gun-cotton, at once explains the cause of the production of smoke by the former, and of the smokelessness of the latter. While the products of explosion of the nitro-compounds consist exclusively of gases and of water-vapor, gunpowder, being composed of a large proportion of saltpetre or other metallic nitrate, mixed with charred vegetable matter and variable quantities of sulphur, furnishes products of which over 50 per cent are not gaseous, even at high temperatures, and which are in part deposited as a fused solid (which constitutes the fouling in a fire-arm), and in part distributed in an extremely fine state of division through the gases and vapors developed by the explosion, thus giving to these the appearance of smoke as they escape into the air.

So far as smokelessness is concerned, no material can surpass gun-cotton; but, even if the rate of combustion of the fibrous explosive in a fire-arm could be controlled with certainty and uniformity, its application as a safe propulsive agent is attended by so many difficulties, that the non-success of the numerous early attempts to apply it to that purpose is not surprising. Those attempts consisted entirely in varying the density and mechanical condition of employment of the gun-cotton fibre. No difficulty was experienced in thus exercising complete control over the rapidity of burning in the open air; but when the material was strongly confined, as in the bore of a gun, such methods of regulating its explosive force were quite unreliable, as some slight unforeseen variation in the amount and disposition of the air spaces in the mass would develop very violent action. Much more promising results were subsequently obtained by reducing the fibre to a pulp, as in the ordinary process of making paper, and converting this into highly compressed, homogeneous masses. But although comparatively small charges often gave high velocities of projection, without any indications of injury to the gun, the uniform fulfilment of the conditions essential to safety proved to be beyond absolute control, even in guns of small caliber; and military authorities not being, in those days, alive to the advantages which might accrue from the employment of an entirely smokeless explosive in artillery, experiments in this direction were not persevered in. At the same time, considerable success attended the production of safe and uniform gun-cotton cartridges for sporting-guns and the Martini-Henry rifle.

Sir Frederick next referred to the sporting-powder of Capt. Schultze, the E. C. powder, and the smokeless powder of Mr. Alfred Nobel. He also spoke of the action of camphor and liquid solvents when applied to hardening compressed masses of gun-cotton. The nitro-glycerine powder first produced by Mr. Nobel was, he stated, almost perfectly smokeless, and developed very high energy, accompanied by moderate pressures at the seat of the charge; but it possessed certain practical defects, which led to the development of several modifications of that explosive and various improvements in manufacture. The relative merits of this class of smokeless powder, and of various kinds of nitro-cellulose powder, were under careful investigation in this and other countries, and several more or less formidable difficulties have been met with in their application, in small-arms especially. These arise in part from the comparatively great heat such explosives develop, which increases the erosive effects of the products of explosion, and in part from the more or less complete absence of solid products. The surfaces of the barrel and of the projectile, being left clean after the firing, are in a condition favorable to their close adhesion while the bullet is propelled along the bore, with the consequent establishment of very greatly increased friction. The latter difficulty has been surmounted by more than one expedient at the cost of losing absolute smokelessness.

Our knowledge of the results obtained in France and Germany with the use of smokeless powders in the new rifles and in artillery is somewhat limited. Our own experiments have demonstrated that satisfactory results are attainable. The importance of insuring that the powder shall not be liable to undergo chemical change detrimental to its efficiency or safety, when stored where it may be subject to considerable variations of temperature, necessitates qualities not very easily secured in an explosive agent consisting mainly of the comparatively sensitive nitro-compounds to which the chemist is limited in the production of a smokeless powder. It is possible, therefore, that the extent of use of such a material in our ships, or in our tropical possessions, may have to be limited by the practicability of fulfilling certain special conditions essential to its storage without danger of possible deterioration. If, however, great advantages are likely to attend the employment of a smokeless explosive, it will be well worth while to adopt such special arrangements as may be required for securing these without incurring special dangers. This may prove to be especially necessary in our ships of war, where temperatures so high as to be prejudicial even to ordinary black powder sometimes prevail in the magazines, consequent mainly upon the positions assigned to them in the ships, but which may be guarded against by measures not difficult of application.

The press and other accounts of the wonderful performances of the first smokeless powder adopted by the French engendered a belief that a very great revolution in the conduct of campaigns must result from the introduction of such powders. It was even reported very positively that noiselessness was one of the important attributes of a smokeless powder; and highly colored comparisons have, in consequence, been drawn in service periodicals, and even by some military authorities, between the battles of the past and those of the future. The absence of recoil when a rifle was fired with smokeless powder was another of the marvels reported to attend the use of these new agents of warfare. It need scarcely be said that a closer acquaintance with them has dispelled the credit given to such of the accounts of their supposed qualities as were mythical.

The extensive use which has been made in Germany of smokeless or nearly smokeless powder in one or two special military displays, has, however, afforded interesting indications of the actual change which is likely to be wrought by these new explosives in the conditions under which engagements on land will be fought in the future. Although the German powder is not actually smokeless, the almost transparent film of smoke produced by independent rifle-firing is not visible at a distance of about 300 yards, and the most rapid salvo-firing by a large number of men does not have the effect of obscuring them from distant observers. When machine-guns and field artillery are fired with our own almost absolutely smokless powder which we are employing, their position is not readily revealed to distant observers by the momentary vivid flash of flame and slight cloud of dust produced. In the naval service, it is, especially for the quick-firing guns, so important for defensive purposes, that a smokeless powder has been anxiously looked for.

The ready and safe attainment of very high velocities of projection through the agency of these new varieties of explosive agents, employed in guns of suitable construction, would appear at first

sight to promise a very important advance in the power of artillery. The practical difficulties attending the utilization of these results are, however, sufficiently formidable to place, at any rate at present, comparatively narrow limits upon our powers of availing ourselves of the advantages in ballistics which they may present. The strength of the gun-carriages, and the character of the arrangements used for absorbing the force of recoil of the gun, need considerable modifications; greater strength and perfection of manufacture are imperative in the case of the shells to be used with charges of a propelling agent, by the firing of which in the gun they may be submitted to comparatively very severe concussions; the increased friction to which portions of the explosive contents of the shell are exposed by the more violent setting back of the mass may increase the possibility of their accidental ignition before the shell has been projected from the gun; the increase of concussion to which the fuze in the shell is exposed may give rise to a similar risk consequent upon an increased liability to a failure of the mechanical devices which are applied to prevent the igniting arrangement from being set into action prematurely by the shock of the discharge; lastly, the circumstance that the rate of burning of the time-fuze which determines the efficiency of a projected shrapnel shell is materially altered by an increase in the velocity of flight of the shell, also presents a source of difficulty.

One of the first uses for purposes of warfare, to which it was attempted to apply gun-cotton, was as a charge for shells.

The author next again refers to the French melinite, and states that, although the secret of its composition was well kept, it soon transpired that the French authorities were purchasing large quantities of picric acid; and this led to the inference that this substance, known to be explosive, was used in the preparation.

The precise nature of melinite, Sir Frederick continued, appears to be still only known to the French authorities. It is asserted to be a mixture of picric acid with some material imparting to it greater power; but accounts of accidents which have occurred, even quite recently, in the handling of shells charged with that material, appear to show, that, in point of safety or stability, it is decidedly inferior to simple picric acid. Reliable as the latter is in this respect, its employment is, however, not unattended with the difficulties and risks which have to be encountered in the use, in shells, of other especially violent explosives. Future experience in actual warfare can alone determine decisively the relative value of violent explosive agents, and of the comparatively slow explosive, gunpowder, for use in shells; it is certain, however, that the latter still presents distinct advantages in some directions, and that there is no present prospect of its being more than partially superseded as an explosive for shells. Referring to submarine mines and locomotive torpedoes, such as the Whitehead and Brennan torpedoes, Sir Frederick stated that progress recently made in the practical development of explosive agents has not resulted in the provision of a material which equals wet compressed gun-cotton in combining with great destructive power the safety to those who have to deal with these weapons.

The president next proceeded to deal with the question of explosions in mines, dwelling at some length on the use of naked lights and safety-lamps,—a subject upon which he is, as is well known, an authority. The petroleum industry next occupied his attention, the following statistics being given of the product of the United States:—

In 1859, 5,000 barrels (of forty-two American gallons) were produced; in the following year the production increased to 500,000 barrels; while in the next year (1861) it exceeded 2,000,000 barrels, at which figure it remained, with slight fluctuations, until 1865. The supply then continued to increase gradually, until, in 1874, it amounted to nearly 11,000,000 barrels. In 1880 it amounted to over 26,000,000 barrels, and in 1882 it reached 31,000,000. Since then the supply furnished by the United States has fallen somewhat, and last year it amounted to 21,500,000 barrels. In addition to the petroleum raised in Pennsylvania, there is now a very large production in the State of Ohio, which is, however, transported by pipe-lines in great quantities to Chicago, for use as liquid fuel in industrial operations.

The production of crude petroleum in Russia was next referred to in the address. In 1863 the supplies from the Baku district amounted to 5,018 tons. They increased to somewhat more than double during the succeeding five years. In 1869 and following three years the production reached about 27,000 tons annually, and in 1873 it was about 64,000 tons; three years later, 153,000 tons were produced; and in the following five years there was a steady annual increase, until, in 1882, the production amounted to 677,269 tons; in 1884 it considerably exceeded 1,000,000 tons; and last year it was about 3,300,000 tons. The consumption of crude petroleum as fuel for locomotive purposes has, moreover, now assumed very large proportions in Russia, and many millions of gallons are annually consumed in working the vast system of railways on both sides of the Caspian Sea.

The imported refined petroleum used in this country in lamps for lighting, heating, and cooking, was exclusively American until within the last few years, but a very large proportion of present supplies comes from Russia. The imports of kerosene into London and the chief ports of the United Kingdom during 1889 amounted to 1,116,205 barrels of United States oil, and 771,227 barrels of Russian oil. During the same period the out-turn of mineral oil for use in lamps by the Scottish Shale Oil Companies probably amounted to about 500,000 barrels.

The prospects of less-known or less-worked sources of supply in other parts of the world were next touched upon. The subject led up to some remarks on the discovery and application of natural gas, which, in turn, brought water-gas before the meeting. No address delivered to a scientific body is now complete without some reference to technical education, and Sir Frederick naturally devoted a few paragraphs to that subject. The Imperial Institute also could not with decency have been excluded from an important delivery by its organizing secretary. Sir Frederick, however, with great moderation, confined himself to a few paragraphs on the subject. The address was of great interest, and was listened to by a large audience. It could, of course, have been made doubly instructive had its author dealt with Cordite, among the other explosives upon which he spoke; but this naturally would have been a breach of the conventionalities, for which, no doubt, Sir Frederick was sufficiently thankful.

HEALTH MATTERS.

Danger in Exercise.

THE *Providence Journal* quotes Dr. Patton, chief surgeon of the National Soldiers' Home at Dayton, O., as saying, in an interview he had in Pittsburgh, that, of the five thousand soldiers in the Dayton home, "fully 80 per cent are suffering from heart-disease in one form or another, due to the forced physical exertion of the campaigns;" and he made the prediction, according to the *Medical and Surgical Reporter*, that as large a percentage of the athletes of to-day will be found twenty-five years from now to be victims of heart-disease, resulting from the muscular strains that they force themselves to undergo. As for the likelihood of exercise to prolong life, it may be said, that, according to the statistics of M. de Solaiville, there are more people living in France to-day who have passed the age of sixty than there are in England, the home of athletic sports; and there is probably no nation in Europe more adverse to muscular cultivation for its own sake than the French. Great athletes die young; and a mortality list of Oxford rowing-men, published a few years ago, showed that a comparatively small percentage of them lived out the allotted lifetime. Dr. Jastrow has demonstrated in some very elaborate statistics that men of thought live, on an average, three years and a half longer than men in the ordinary vocations of life.

Decrease of Tuberculosis in England.

There is an instructive lesson in the English mortality returns from tuberculosis for the last forty years, says the *Medical and Surgical Reporter*. In the ten years from 1851 to 1860 the number of deaths from tuberculosis in persons from 15 to 45 years of age amounted to 3,943 in every million; from 1861 to 1870 it had fallen to 3,711; from 1871 to 1880 it was 3,194; and from 1881 to 1887 it did not exceed 2,666. The decreased rate is more marked in the female than in the male sex.

NOTES AND NEWS.

IN August, 1891, a meeting of the Congrès International des Sciences Géographiques will be held at Berne, Switzerland. Societies, or their members individually, are invited to take part in the congress, and to communicate their views on the subjects that should appear in the programme. The management is in the hands of the Geographical Society of Berne.

—A thunder-storm is generally believed to be a bad thing for a dairy. An Italian *savant*, Professor G. Tolomei, has made some experiments on the relation of electricity to the souring of milk. He found, according to *The Boston Medical and Surgical Journal*, that the passage of an electric current directly through the milk not only did not hasten, but actually delayed acidulation; milk so treated not becoming sour until from the sixth to the ninth day, whereas milk not so electrified became markedly acid on the third day. When, however, the surface of a quantity of milk was brought close under the two balls of a Holtz machine, the milk soon became sour, and this effect he attributes to the ozone generated.

—The Caucasus papers relate an interesting case of globular lightning which was witnessed by a party of geodesists on the summit of the Böhul Mountain, 12,000 feet above the sea. About 3 P.M., as related by *Nature*, dense clouds of a dark-violet color began to rise from the gorges beneath. At 8 P.M. there was rain, which was soon followed by hail and lightning. An extremely bright violet ball, surrounded with rays which were, the party says, about two yards long, struck the top of the peak. A second and a third followed, and the whole summit of the peak was soon covered with an electric light, which lasted no less than four hours. The party, with one exception, crawled down the slope of the peak to a better-sheltered place, situated a few yards beneath. The one who remained was M. Tatosoff. He was considered dead, but proved to have been only injured by the first stroke of lightning, which had pierced his sheepskin coat and shirt, and burned the skin on his chest, sides, and back. At midnight the second camp was struck by globular lightning of the same character, and two persons slightly felt its effects.

—A study of five years' thunder-storms (1882–86) on the Hungarian plain has been recently made by M. Hegyfoky, says *Nature* of Sept. 4, 1890. The following points in his paper (communicated to the Hungarian Academy) may be noted. The days of thunder-storm were those on which thunder was observed, and they formed 16.4 per cent of all days from April to September. The air pressure on those days sank about 2 millimetres under the normal, morning and evening. The less the pressure, the greater the probability of thunder-storm. The temperature (estimated by the maximum thermometer) was higher than that of all days of the season indicated; and the moisture and cloudiness were similarly in excess. The wind blew about mid-day more softly, and in the evening more strongly than usual. It went round, as a rule, from the south-east by the south to the west and north-west. The clouds came oftener than usual from the south-east and south-west quadrants, so that the centre was generally north af the station. Nearly half of the season's rainfall was on days of thunder-storm. Hail fell on 11 days, on one of which there was no thunder-storm. There were most thunder-storms in June (59 out of 199). The June of 1886 had as many as 26. The commencement of a thunder-storm (first thunder) occurred most often from 2 to 5 P.M. Towards the end of the season the thunder-storms tend to come later in the day. When the pressure falls under the mean of the season (752.4 millimetres), the thunder-storms last longer than when it is above the mean. The path was in most cases from south-west or west, and in most cases coincided with that of both lower and upper clouds, but in several cases only with that of the lower or upper. After the first thunder the meteorological elements are usually subject to great changes, most marked as the storm nears the zenith: rain falls; wind rises, and alters quickly in direction; temperature and vapor-pressure fall; relative humidity, cloud, and pressure increase. As the storm withdraws there is a return to the normal. Various other points are considered. The author accepts Sohncke's theory, that the electricity of thunder-storms is due to friction of water-drops on ice.

—Dr. G. W. Barr writes, in the *Therapeutic Gazette*, that iced tea has none of the physiological action of theine if it is kept ice-cold for a short time. He says that he has known a man of nervous temperament, who is kept awake all night by a single cup of tea, to drink a half-gallon of iced tea during the evening, and sleep soundly at his usual time of retiring. Others, made very nervous by hot tea, have been able to drink large quantities of iced tea with no appreciable effect. If the tea-grounds are allowed to remain in the liquid, the iced tea is usually kept long enough before drinking to dissolve more tannin than is usual in hot tea: hence the tea should be strained as soon as removed from the fire.

—The process of electric welding invented by Professor Elihu Thomson, which has been so widely used in its application to numerous manufactures pertaining to the arts of peace, has now been applied to the production of certain munitions of war in a very remarkable manner. The problem in making a shell for armor-piercing purposes, says *Engineering* of Aug. 29, has been to select a grade of steel with a view to its possessing the hardest point for armor-piercing purposes consistent with a chamber whose walls shall not be so hard as to crumble on striking a heavy mass. The metal selected for such purposes has been very naturally the result of a compromise in the endeavor to procure a metal which would give as hard a point as feasible under the circumstances; and yet the limitations of all materials are such that neither object has been perfectly accomplished, and the excessive hardness of the inside of ordinary cast-steel projectiles renders the work of clearing out the interior of the chamber very expensive. This application of the electric welding process to the production of shells has reached very satisfactory results, entirely beyond those achieved by methods of manufacture hitherto carried on. The armor-piercing point of the shell is made of hard steel, shaped in the conical form suited for such a purpose. To this is attached a tube of mild steel, forming the chamber. The plastic state of the metal when the two pieces are pressed together in the act of electric welding forms a slight enlargement without cutting away any of the walls of the chamber. The butt of the projectile is made of a piece of mild steel, which is somewhat harder than the cylindrical walls of the chamber, and is shaped to a cup form by hydraulic forging. The slight exudation of the metal at the walls on the inside produces an interior ring, which is a material increase in the strength of the projectile. For Shrapnel, the thin metal screen between the charge and the bullet-case is placed in position before the head is welded to the cylindrical chamber of the projectile, and readily joined in place in the act of welding. This new application of the electric-welding process was invented by Lieut. W. M. Wood of the United States Navy, who has received a year's leave of absence from the government, and is in the mean time associated with the Thomson Electric Welding Company. It is stated that the United States Government is ready to contract for a very large supply of these electric shells as soon as the machinery can be made for their manufacture.

—A new process of bleaching by electricity has been devised for the textile trades. By its use the need of bleaching powder is done away with. The process, as described in *Engineering*, is as follows: the current is taken direct from an engine and dynamo to electrodes placed in a wooden tank containing a solution consisting of 64 pounds of calcined magnesia, 357 pounds of hydrochloric acid, specific gravity 1.16, and 300 gallons of water, which solution has no bleaching properties; in other words, no chlorine is present. After passing an electro-motive force of six volts, and a current of 120 ampères, for 100 hours, the solution contains .25 of one per cent of fixed chlorine, which bleaches yarn and tow in as many hours as it now takes days, without impairing the strength of the material. The electrodes used consist of three cathodes of sheet copper, each 27 inches by 18 inches. These are connected to the negative terminal of the dynamo. The anode employed is "lithanode," a peroxide of lead, which is specially adapted for this particular purpose, all other metals being attacked by chlorine, which disqualifies them for all purposes of electrolysis where chlorine is evolved. The anodes are 7 inches by 4 inches, and are seventy-two in number, and are connected to the positive terminal. These electrodes are ranged along the sides

and bottom of the tank, and are protected from the yarn to be bleached by a wooden framework. What chemical re-actions take place during the 100 hours required for charging the solution cannot be accurately determined; but that the system is regenerative there can be little doubt, owing to the fact that bleaching is performed by the fixed chlorine, and consequently there can be no loss of free chlorine, as is the case with bleaching-powder.

—An Italian correspondent writes to the *Lancet*, "An occurrence as strange as it is tragic is just reported from Sicily. At Milazzo, a seaport of that island, a bark had put in after a voyage from Genoa, having in her hold, by way of ballast, a number of wine-butts, which, incrusted on their insides with tartrates, had, to give them the necessary weight, been filled with salt water. On coming into harbor, these butts had to be emptied before refilling them with wine; and for that purpose one of the crew, having raised the trap door admitting to the hold, went down to tap them and run their contents through the drain-holes into the sea. No sooner had the bungs been knocked out than forth rushed a poisonous gas, which took the man's breath away and made him fall, a corpse, into the escaping salt water. In ignorance of what had happened, a second mariner, then a third, and finally a fourth, went below; each, in turn, to be asphyxiated instantaneously, and to fall headlong into the salt water, now of some depth in the hold. As the butts continued to empty, the poisonous gas increased; and the captain, wondering that none of the four men re-appeared, went, out of curiosity, to the trap-door, only to receive a tremendous rush of the gas in his face, and to fall below, asphyxiated and drowned. The cabin-boy, the sole survivor out of a crew of six, seeing what had happened, shouted wildly for help to the bystanders on the quay. Assistance soon came; and the stifling fumes, by this time escaped or so diluted as to be innocuous, admitted of the new-comers looking down into the hold. There were the five men, quite dead, floating in the water. The corpses were hoisted up with ropes; and the medical officers, who had now arrived, pronounced them past recovery." We give this story for what it is worth.

—The following sensational and untrue paragraph (dated St. Louis, Sept. 11) has been going the rounds of the press, evidently in the interest of the producers of Ceylon tea, who are trying to make a market in this country for their tea, says the *American Grocer*: "G. E. Martin, who is a resident of Ceylon and an extensive coffee-planter there, owning, with his brother, two of the largest estates on the island, was interviewed here to-day, and confirms the report of the failure of the coffee-crop. He said, 'I cannot explain how, but coffee will no longer make a good crop in the Far East, not only in Ceylon and Arabia, but also in the other coffee raising districts. I have just received a letter from my father, in which he informs me that our estate must immediately be put into tea and fruit, as there is no longer any chance of making a profitable coffee-crop. We shall lose fifty thousand dollars this year on our crop, and it is generally so throughout the coffee-growing districts. In South America, which I visited before coming to this country, the same situation prevails. The crop will not grow. I can see no other result than that we must stop drinking coffee. We can no longer raise it, and the countries where it will grow are already exhausted.'" A few facts will show the utter fallacy of the statement, the only part of which that is true being the fact that Ceylon is out of the race as a producer of coffee. It is true that in Ceylon the industry has declined, the exports of coffee decreasing from a maximum crop from which 995,493 hundredweight were exported in 1873, to 86,440 hundredweight in 1889, the decrease being due to a disease which destroyed the trees. In 1873, when the Ceylon crop was the largest on record, the production in Brazil permitted exports of about 150,000 tons, against an average annual export for the five years 1885-89 of 319,281 tons,—an increase in production of over 100 per cent. In Sumatra the crop of recent years has been below the average. In Java the supply does not increase, the crop varying, as it does in all countries, above and below an average yield, which for the eleven years permitted an average annual export of 1,167,009 piculs. The production of the world in 1888-89 was estimated by W. Schoffer & Co., high authorities in Europe and this country, at 12,831,600 centners, or 631,489 tons,—quite an advance over 1879, when N. P. Van Den Berg of Batavia estimated the production at 483,087 tons; which, in turn, was a large advance over the 324,787 tons produced in 1860. Coffee-plantations are being extended in Mexico and the different countries of Central and South America, because there is at present, and has been for several years, an immense profit in coffee-culture, high prices placing a premium on the extension of the industry. In a few years more we look for a production far enough ahead of the world's requirements to again inaugurate an era of low-priced coffee, notwithstanding the Ceylon estates are no longer productive.

—We learn from *Nature* that countless swarms of rats periodically make their appearance in the bush country of the South Island, New Zealand. They invariably come in the spring, and apparently periods of about four years intervene between their visits. In a paper published in the new volume of the "Transactions and Proceedings of the New Zealand Institute," Mr. Joseph Rutland brings together some interesting notes on the bush-rat (*Mus maorium*). In size and general appearance it differs much from the common brown rat. The average weight of full-grown specimens is about two ounces. The fur on the upper portions of the body is dark brown, inclining to black; on the lower portions, white or grayish white. The head is shorter, the snout less sharp, and the countenance less fierce, than in the brown species. On the open ground, bush-rats move comparatively slowly, evidently finding much difficulty in surmounting clods and other impediments: hence they are easily taken and destroyed. In running they do not arch the back as much as the brown rat. This awkwardness on the ground is at once exchanged for extreme activity when they climb trees. These they ascend with the nimbleness of flies, running out to the very extremities of the branches with amazing quickness: hence, when pursued, they invariably make for trees, if any are within reach. The instinct which impels them to seek safety by leaving the ground is evidently strong. A rat, on being disturbed by a plough, ran for a while before the moving implement, and then up the horse-reins, which were dragging along the ground. Another peculiarity of these animals is, that, when suddenly startled or pursued, they cry out with fear, thus betraying their whereabouts,—an indiscretion of which the common rat is never guilty.

—In a paper recently read before the Vienna Academy, says *Nature* of Aug. 28, 1890, Herren Elster and Geitel gave the results of a year and a half's observations of atmospheric electricity on the north side of Wolfenbüttel (bordering an extensive meadow). They used a stand carrying a petroleum-flame, and connected by insulated wire with an electroscope. A marked difference was found in the phenomena of spring, summer, and autumn, on the one hand, and winter on the other. In the former the daily variation of the fall of potential showed a distinct maximum between 8 and 9 A.M., as Exner found at St. Gilgen, and a distinct minimum between 5 and 6 P.M., whereas Exner found a maximum about 6. In winter there is great irregularity; but a weak minimum occurs about 11 A.M., and a more decided maximum about 7 P.M. It appears to the authors that other factors than humidity, with which Exner seeks to explain the variations, are concerned in the case. When the temperature goes below zero, cold mist being then generally present, there is often a rather sharp rise in the values, the aqueous vapor having then less action. Rainfall in a neighboring region lowers the fall of potential both in winter and summer, and a disturbance of the normal course will announce a coming change in places still unclouded. Snow, it seems, rather raises the values. It has been shown by Linss that the course of the fall of potential is inversely as the coefficient of dispersion of the air for electricity; which, again, depends not only on the dust and aqueous vapor present, but also, according to Arrhenius's theory, on a sort of electrolytic or dissociative action of the sun's rays on the atmosphere (thus it has been shown that electricity escapes from a conductor under the influence of ultra-violet rays). The authors find their results support this latter view. They consider that the electric processes during formation of precipitates are the chief cause of the disturbance of the normal condition.

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Attention is called to the "Wants" column. All are invited to use it in soliciting information or seeking new positions. The name and address of applicants should be given in full, so that answers will go direct to them. The "Exchange" column is likewise open.

Vol. XVI. NEW YORK, September 19, 1890. No. 398.

CONTENTS:

LOW WATER IN BOILERS.

The Manchester Steam Users' Association for the Prevention of Steam-Boiler Explosions and for the Attainment of Economy in the Application of Steam publishes (Manchester, 1889) the report of its chief engineer, Mr. Lavington E. Fletcher, on a series of experiments conducted by him to determine the much-debated question of the advisability of throwing cold water into a steam-boiler in which portions of the heating surfaces had become red-hot through shortness of water. The same investigator had, as early as 1867, performed similar experiments to those here described, on simple household boilers, and corroborated a deduction, coming of occasional accidental illustrations of the same phenomena, that the introduction of cold water into such boilers may destroy them by producing strain and seam-rips by the great and irregular contraction thus caused.[1] The special object of the recent experiments was to ascertain precisely what occurred when the furnace-crowns of fire-box boilers were left bare of water and overheated, and then flooded with feed-water.

A Lancashire boiler (7 feet diameter, 27 feet long), with furnaces 3 feet in diameter and grates 6 feet long, was used for the work. It was of $\frac{7}{16}$ inch iron, of ordinary construction, and set in the usual manner. Two feed-pipes were used,—the one, as commonly arranged. to discharge its contents behind the bridge; the other a special construction, throwing the water directly upon the crown of the furnace. Suitable barricades and "bomb proofs" protected the observers and others from danger in case of explosion.

Thus arranged, the boiler was subjected to repeated experiment; the water being blown out below the level of the furnace crown, sometimes to a greater, sometimes to a less extent; the feed water introduced, sometimes by the regular feed-pipe, sometimes by the showering arrangement; the pressures were sometimes high, sometimes low; the safety-valves sometimes open, sometimes closed. But in no case was the boiler injured by the introduction of the feed, and no explosion took place. In some instances the furnace-crowns came down; but this was always the effect of pressure, and not of the introduction of cold water, the latter invariably reducing the pressure promptly, except where the pressures were initially very low, or nearly atmospheric, in which case the introduction of the feed-water occasionally caused slight but momentary rise of pressure.

The conclusion of the experimenter is, that "these experiments put to rout the generally entertained opinion that showering cold water on red-hot furnace-crowns would cause the 'instantaneous disengagement of an immense volume of steam,' which would act 'like gunpowder,' overpowering the safety-valves however efficient, tearing the outer shell of the boiler to pieces, and hurling the fragments to a considerable distance."

The writer of the report goes on to say, "It would have been well if they had been tried some fifty years ago, in the days when high-pressure steam was young, when the cause of steam-boiler explosions was shrouded in mystery, and the easiest way out of the dilemma was to blame the stoker." But such experiments *have* been repeatedly tried in earlier years; and some of the most interesting and important, more than a half-century ago, by the Franklin Institute in this country, exhibited precisely the facts here again shown.[1] The later work of the United States Board of 1875 was but irregularly and unsatisfactorily published; but our information, such as it is, leads to nearly the same conclusions, with this important qualification: that while, as a rule, explosion does not result on introducing feed-water into a red-hot boiler, it nevertheless may, and sometimes does, take place. Mr. Fletcher concludes from these latest experiments that the right thing to do, on discovering low water in a boiler, is to put on the feed at once.

It would seem that this statement should be given the form, "The probabilities of fatal accident are slight in such cases, and the wiser plan is to at once put on the feed-water in full force, *then* proceed to dampen the fires. We would not draw them; that being certain to, at least momentarily, greatly increase the heat of the furnace."[2]

The report of the Franklin Institute was made to the secretary of the treasury in 1836. The conclusion reached was that the injection of water upon the heated surfaces of the experimental boiler produced a sudden and considerable rise of pressure.[3]

The work of the government board led to the conclusion by Dr. Thurston that "the overheating of the metal of a boiler in consequence of low water may or may not produce explosion, accordingly as the sheet is more or less weakened, or as the amount of steam made by the overflow of the dry heated area by water is greater or less."[4]

There would seem to be no question, in the light of our present knowledge, that low water, in some cases, may produce, or at least initiate, disastrous explosions; while there is as little doubt that it is only under conditions which are very rare, and very difficult of production, that such result may be expected to occur. The contributions of Mr. Fletcher to the literature and the facts of this important matter are as welcome as they are interesting and valuable.

[1] Mechanics' Magazine, May, 1867; London Engineer, March 15, 1867, p. 228.

[1] Journal Franklin Institute, vol. xvii. 1837.

[2] Thurston's Manual of the Steam-Boiler, p. 614, § 292.

[3] *Ibid.*, p. 635.

[4] *Ibid.*, p. 643. See also, especially, pp. 567, 568, arts. 277–279.

LETTERS TO THE EDITOR.

*** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

The editor will be glad to publish any queries consonant with the character of the journal.

On request, twenty copies of the number containing his communication will be furnished free to any correspondent.

Dr. A. Graham Bell's Studies on the Deaf.

CALLING a statement a mistake does not make it one. Permit me to respond briefly to what are called my mistakes:—

1. The statement (p. 85) which Dr. Bell denies, was accompanied by reference to the authority for my quotation. It was taken from the *British Medical Journal* of May 11, 1889, a reputable English periodical, and has since been quoted in the *British Quarterly Review of Deaf Mute Education.* My responsibility ceases upon the production of such evidence. The misstatement cannot, by the wildest liberty of imagination, properly be called mine.

2. The so-called mistakes in the final paragraph (p. 119) can easily be detected, if they exist, for the official sources of information are given. The papers presented to the British House of Commons on deaf-mute matters contain a report from the United States, dated Oct. 5, 1886 (pp. 51–55).

In June, 1884, at a convention of oral teachers held in New York City, of which Dr. Bell was permanent chairman, F. H. Wines, Esq., the special census officer in charge of statistics of this character, said, "There must be in the United States, I think, not less than five thousand children, who are of proper age to attend school, who have never seen the inside of any institution" (*Official Report of Convention,* p. 5). Several months later, at the Gallaudet Centennial in Philadelphia, Dr. Bell used the following language: "In 1880, with all our magnificent institutions, and with all our beneficence, we still had fifteen thousand children of school age in the country; and in all our institutions and schools put together there were only a little over five thousand, and many of these were over the school age" (*Silent World,* Philadelphia; and *Dr. Bell's Speech at Gallaudet Conference of Principals,* p. 16). These two extracts and the "Report to the British House of Commons" are sufficient evidence of the correctness of my final paragraph (p. 119).

3. I am also condemned for not giving the statement of what the theory of a deaf-mute race is. It ought to be remembered that the article on "Scientific Testimony," reprinted in your columns, appeared originally in the *American Annals of the Deaf.* The readers of that journal are perfectly familiar with what the theory of a deaf-mute race is, and the statement of it there would be altogether unnecessary. It was Dr. Bell himself who first suggested the printing of this article in *Science;* and it is difficult to understand how he can now turn upon the writer, and condemn what he is himself responsible for, so far as the wider publicity of the article is concerned.

4. But the *gravamen* of my offence, "the climax of my numerous mistakes," as Dr. Bell terms it, is that I have attributed the theory of a deaf-mute race to him. It would certainly be inexcusable in a teacher of the Hartford school not to know that Rev. William Turner first suggested this theory, if such a teacher could be found. Does the doctor really believe that it is the culmination of my errors that I did not charge him with borrowing this theory? I have nowhere said he originated it. According to this rule, we must never speak of the Darwinian theory, for it is well known that it had already been suggested long before it had been elaborated by Darwin. Theories take the names of their most illustrious expounders. It was in this sense, without the least suspicion of an invidious suggestion, that I, in common with the press and the colloquial habit of the country, spoke of Professor Bell's theory of a deaf-mute race. I confess to a considerable degree of mortification in finding myself obliged to deal with matters of so trivial a character as the charges this letter contains; but, when the head and front of my offending turns upon so minute a point as the proper designation of a theory which has been presented to the public by Professor Bell, I may well feel some degree of satisfaction with the real question of which these side issues are mere cobwebs. I hope to be able in a few weeks to present a few thoughts on hereditary deafness; but I shall not again reply to charges of misstatements, unless I have been guilty of some inadvertence which does injustice.

REV. W. G. JENKINS.

Hartford, Conn., Sept. 8.

I HAVE read the review of the "Facts and Opinions" respecting the deaf, published by Mr. A. Graham Bell, which appeared in your issue of Aug. 15. The reviewer, Mr. W. G. Jenkins of Hartford, quotes my opinion as to the cause of deafness, which is characteristic of many batrachians, which was, that it is due to disuse which follows the absence of sound in the subterranean and subaquatic region which they inhabit. The reviewer then goes on to point out that there is no analogy between such animals and the deaf-mutes among mankind, who live, like their fellowmen, in the midst of sounds.

Mr. Jenkins has overlooked the questions put by Mr. Bell, and hence has missed the significance of the answer, in my case at least. The first question was whether it was thought probable that a race of human deaf-mutes could be established. My reply was that I thought that such a race could be established. My reasons were, first, the analogy of the batrachians and other *Vertebrata;* and, second, the probability that by continuous intermarriage such a peculiarity could become established as congenital. I did not offer any opinion as to how the deafness might originate in mankind; for on this subject I had, and have now, no sufficient information. As to the question of the transmittal of such a character, your readers are referred to my essay on "Inheritance in Evolution," which appeared in the *American Naturalist* for December, 1889.

E. D. COPE.

Philadelphia, Sept. 5.

The "Barking Sands" of the Hawaiian Islands.

ABOUT a year ago *Nature* printed my letter from Cairo, giving a condensed account of an examination of the Mountain of the Bell (*Jebel Nagous*) on the Gulf of Suez, and of the acoustic phenomenon from which it is named. In continuation of my researches on sonorous sand, which are conducted jointly with Dr. Alexis A. Julien of New York, I have now visited the so called "barking sands" on the island of Kauai. These are mentioned in the works of several travellers (Bates, Frink, Bird, Nordhoff, and others), and have a world-wide fame as a natural curiosity; but the printed accounts are rather meagre in details, and show their authors to have been unacquainted with similar phenomena elsewhere.

On the south coast of Kauai, in the district of Mana, sand-dunes attaining a height of over one hundred feet extend for a mile or more nearly parallel to the sea, and cover hundreds of acres with the water worn and wind-blown fragments of shells and coral. The dunes are terminated on the west by bold cliffs (*Pali*) whose base is washed by the sea; at the east end the range terminates in a dune more symmetrical in shape than the majority, having on the land side the appearance of a broadened truncated cone. The sands on the top and on the landward slope of this dune (being about 100 yards from the sea) possess remarkable acoustic properties, likened to the bark of a dog. The dune has a maximum height of 108 feet, but the slope of sonorous sand is only 60 feet above the level field on which it is encroaching. At its steepest part, the angle being quite uniformly 31°, the sand has a notable mobility when perfectly dry; and on disturbing its equilibrium it rolls in wavelets down the incline, emitting at the same time a deep bass note of a tremulous character. My companion thought the sound resembled the hum of a buzz-saw in a planing-mill. A vibration is sometimes perceived in the hands or feet of the person moving the sand. The magnitude of the sound is dependent upon the quantity of sand moved, and probably to a certain extent upon the temperature. The dryer the sand, the greater the amount possessing mobility, and the louder the sound. At the time of my visit the sand was dry to the depth of four or five inches. Its temperature three inches beneath the surface was 87° F., that of the air being 83° in the shade (4.30 P.M.).

When a large mass of sand was moved downward, I heard the sound at a distance of 105 feet from the base, a light wind blowing at right angles to the direction. On one occasion horses standing close to the base were disturbed by the rumbling sound. When the sand is clapped between the hands, a slight hoot like sound is heard; but a louder sound is produced by confining it in a bag, dividing the contents into two parts and bringing them together violently. This I had found to be the best way of testing seashore sand as to its sonorousness. The sand on the top of the dune is wind-furrowed, and generally coarser than that of the slope of 31°; but this also yielded a sound of unmistakable character when so tested. A bag full of sand will preserve its power for some time, especially if not too frequently manipulated. A creeping vine with a blue or purple blossom (*kolokolo*) thrives on these dunes, and interrupts the sounding slope. I found the main slope 120 feet long at its base; but the places not covered by this vine gave sounds at intervals 160 paces westward. At 94 paces further the sand was non-sonorous.

The native Hawaiians call this place *Nohili*, a word of no specific meaning, and attribute the sound caused by the sand to the spirits of the dead (*uhane*), who grumble at being disturbed; sand-dunes being commonly used for burial-places, especially in early times, as bleached skeletons and well-preserved skulls at several places abundantly show.

Sand of similar properties is reported to occur at *Haula*, about three miles east of Koloa, Kauai. This I did not visit, but, prompted by information communicated by the Hon. Vladimar Knudsen of Waiawa, I crossed the channel to the little-visited island of Niihau. On the western coast of this islet, at a place called *Kaluakahua*, sonorous sand occurs on the land side of a dune about 100 feet high, and at several points for 600 to 800 feet along the coast. On the chief slope, 36 feet high, the sand has the same mobility, lies at the same angle, and gives when disturbed the same note as the sand of Kauai, but less strong, the slope being so much lower. This locality has been known to the residents of the island for many years, but has never before been announced in print. This range of dunes, driven before the high winds, is advancing southward, and has already covered the road formerly skirting the coast.

The observations made at these places are of especial interest, because they confirm views already advanced by Dr. Julien and myself with regard to the identity of the phenomena on sea-beaches and on hill-sides in arid regions (*Jebel Nagous*, *Rig-i-Rawan*, etc.). The sand of the Hawaiian Islands possesses the acoustic properties of both classes of places; it gives out the same note as that of Jebel Nagous when rolling down the slope, and it yields a peculiar hoot-like sound when struck together in a bag, like the sands of Eigg, of Manchester (Mass.), and other sea-beaches,—a property that the sand of Jebel Nagous does not possess. These Hawaiian sands also show how completely independent of material is the acoustic quality, for they are wholly carbonate of lime, whereas sonorous sands of all other localities known to us (now over one hundred in number) are silicious, being either pure silex or a mixture of the same with silicates, as felspar.

The theory proposed by Dr. Julien and myself to explain the sonorousness has been editorially noticed in *Nature*, but may properly be briefly stated in this connection. We believe the sonorousness in sands of sea-beaches and of deserts to be connected with thin pellicles or films of air, or of gases thence derived, deposited and condensed upon the surface of the sand-grains during gradual evaporation after wetting by the seas, lakes, or rains. By virtue of these films the sand-grains become separated by elastic cushions of condensed gases, capable of considerable vibration, and whose thickness we have approximately determined. The extent of the vibrations, and the volume and pitch of the sounds thereby produced after any quick disturbance of the sand, we also find to be largely dependent upon the forms, structures, and surfaces of the sand-grains, and especially upon their purity, or freedom from fine silt or dust ("Proceedings American Association for the Advancement of Science," 38, 1889).

I should be lacking in courtesy if I closed this letter without expressing my great obligations to Mr. H. P. Faye of Mana, and to Mr. George S. Gay of Niihau, for both a generous hospitality and a sympathetic assistance in carrying out my investigations.

H. CARRINGTON BOLTON.

Honolulu, H.I., May 26.

BOOK-REVIEWS.

Civil Government in the United States considered with Some Reference to its Origins. By JOHN FISKE. New York, Houghton, Mifflin, & Co. 12°. $1.

THIS is not such a work as we expected from Mr. Fiske. We thought when we took it up that we should find it a philosophical treatise on the nature and functions of government, but that is just what it is not. The author does, indeed, ask what government is, but dismisses the question in a single sentence; there is nothing in the book about the nature and uses of law; and the ethical principles that lie at the basis of civil society are never once alluded to. The work is purely descriptive and historical, and treats, not of government, but of governmental machinery only. Moreover, one-half the book is devoted to municipal government,—to the town, the city, and the county,—the city alone receiving as much attention as the State. But such a mode of treatment magnifies the work of the municipalities out of all proportion to its importance. The essential element in our political system is the State, and the municipalities are merely agencies of the State for certain administrative purposes.

But though we cannot agree with Mr. Fiske's conception of his subject, yet the work he has actually done is well done. He has given a description of the various agencies of government in the United States which is both accurate and clear, and in a smaller space than we should have thought possible. The book also conveys a good deal of interesting historical information, especially in the part devoted to the town and the county. Questions for pupils, and suggestions for teachers, adapt the work for use in schools; and its value is increased by an appendix containing the Articles of Confederation, the National Constitution, a translation of the Great Charter of King John, and other interesting documents.

Die Furcht. Von A. MOSSO. Aus dem Italienischen übersetzt von W. Finger. Deutsche Original-Ausgabe, mit 7 Holzschmitten und 2 Lichtdruck-Tafeln. Leipzig, Verlag von S Hirzel. 1889.

THERE are two classes of scientific men. To the one class belong the enthusiastic, absorbed searchers after truth, who are driven by an inborn impulse to grapple with Nature, and who find their highest happiness in wresting her secrets from her. They are unfortunately in the minority, for they are the pioneers of science. The other class are many, and range in culture from learned men down to those who read for the sake of a subject to talk about. The purpose of the work and study of the latter is social influence. Both classes are useful, the second acting as the interpreter of the truths which the former have extorted from nature.

It is seldom that the scientific investigator has personally the time and the necessary contact with the masses of the people to enable him to popularize his own observations and experiments. Mosso, however, has undertaken the task with Italian geniality. The charm of his book is that he is himself so enthusiastic in and enraptured by his scientific work that he must seek to interest others also. He says of it, "It is a work full of patience. The only difficulty consists in gradually learning to understand Nature's speech; to find ways and means of questioning her, and compelling her to answer us. In this struggle in which we, modest pygmies, are continually striving to grasp the secret of life, there are delightful moments, lights and shadows, which excite the imagination of scientist and artist."

His enthusiasm does not cause him to forget that he is writing for the people as well as for his colleagues in science. Though his language is as free of technical terms as possible, the work is pregnant with scientific observations and experiments, chiefly the result of his own study, some of them as yet unpublished. The chapters in which he describes the pulsations of the blood in the

brain are fascinating.[1] Three patients came to him whose skulls had been so disturbed by disease or accident that he was able to see and register the pulsations of their brains through the window-like opening thus formed. The observations were made in sleeping and in waking moments. The registered curves proved that every emotion, every thought, is accompanied by an increase in the volume of blood in the brain. The severer the mental work, the more violent the emotion, the stormier were the pulsations of the brain. Another interesting series of experiments which the author describes are those made with an originally constructed balance, by means of which he was able to register the respiratory movements and the flow of the blood from the feet to the head. The table of the balance was large and wide enough for a man to lie at full length upon it. It was upon this table that Mosso observed that a sudden noise caused the blood of a man asleep upon the table to leave the lower extremities and flow to the head; further, that the head end of the balance sank deeper during the solution of a difficult mathematical problem than when the mind was less severely occupied. By these two methods, as well as by means of the more common methods of registering the beat of the heart and the respiratory movements of the lungs, he found that any sensation exciting fear sends the blood to the brain, increases the strength and frequency of the heart-beat, and alters the regularity of the breathing. He describes the effect upon our system thus: "We men, who constantly carry the fragile machinery of our body about with us, must remember that every jolt that exceeds the ordinary limit can be fatal to us; that a slight shove accelerates the motion of the wheels, a stronger one arrests the motion, a gentle push drives us forward, a violent jerk throws us to the ground. For this reason the phenomena of fear, which in a small degree might be useful to us, become unhealthy and fatal to the organism as soon as they exceed certain limits: hence one must look upon fear as an illness."

He denies that the phenomena of fear, as trembling, scowling, the raising of hair and feathers, are essential to the survival of the fittest, and claims that the strong and healthy animals are those who do not fear, but concentrate all their powers to escape or defy the enemy. To the weak man a sudden danger brings fear; to the strong it is an incentive to action.

Fear, however, does not act upon the distribution of the blood and upon the respiration alone; but, since our body is a unit, it acts also upon the muscles,—those of the eye, the skin, the face, the digestive and secretory organs, as well as upon the larger muscles of motion. All this is of special interest (1) to the educator, the physician, and parent; (2) to the artist, the novelist, and poet. To the former Mosso's words are, "The first purpose of an education must be to increase man's strength, and to favor every thing that sustains life." Further, "One moment of violent fear causes far more dreadful effects and significantly severer injuries in woman than in man; but the fault is ours, who have always considered woman's weakness as a charm and an attraction; it is the fault of our educational system, that seeks to develop the emotional nature in woman, and, on the other hand, neglects that which would be more effectual,—to give her character. We imagine sometimes that the most important part of culture is that which education and study have given us; that the progress of mankind is accomplished entirely through the science, the literature, the works of art, which the generations have handed down to one another; but we carry a no less important part of the progress of culture with us in our blood. Civilization has reconstructed our nervous system; there is a culture that is transferred to the brains of the children by inheritance; the superiority of the present generation depends upon its greater ability to think and act. The future of a nation does not exist in its trade, its science, its army alone; but it exists in the bodies of its citizens, in the lap of its mothers, in the courageous or cowardly disposition of its sons."

To the latter he says, "When art extends its territory over all visible nature, it will find an incomparably greater number of powerful effects in the reproduction of pain than art possessed in classical times. The difficulties are certainly far greater here than in the dignified production of ideal beauty. And the painters and sculptors who undertake the great problem of reproducing pain will be obliged to equip themselves with a study of nature, and with anatomical and physiological knowledge to an extent for which, up to the Hellenic period, we have no example in art."

It is to illustrate the expressions of the face in suffering and fear in their wonderful variety, that the author reproduces, in two lithographic plates, a series of sixteen photographs taken of a boy while enduring an oft-repeated painful operation. They are worthy the study of psychologist and artist. The width of the horizon which art is to possess when incited by this new physiological knowledge is best indicated by his own words, which shall at the same time be the final ones of this article.

"I believe that with the progress in scientific criticism, together with an exact knowledge of physiology and the functions of the muscles, we shall come to the point where we can claim that the Greeks were not adequately prepared to represent the violent emotions effectively."

[1] Ueber den Kreislauf des Blutes im Menschlichen Gehirn (Leipzig, Veit u. Co., 1881); "La temperatura del cervello studiata in rapporto colla temperatura di altre parti del corpo," in the pamphlets of the R. Accademia dei Lincei (Rome, 1889); Sui movimenti idraulici dell' veide (K. medic. Akademie in Turin, 1875); Mosso et Pellaconi, Sulle funzioni della vescica (R. Accademia dei Lincei, Bd. XII., 1881; Archives italiennes de Bologne, 1882).

Economic and Social History of New England, 1620–1789. By WILLIAM B. WEEDEN. New York, Houghton, Mifflin, & Co. 2 vols. 8°. $4.50.

THIS is an elaborate and painstaking work, dealing with the whole subject of New England industry from the first settlements to the foundation of the present Federal Government. Beginning with the landing of the Colonists in the wilderness, the opening chapters are largely devoted to the subjects of agriculture, the distribution of land, and trade with the Indians. Ocean commerce and manufactures claim attention a little later, and soon become the most prominent parts of the subject. The social life of the Colonists is described with less fulness than the economic, but yet is never neglected. The whole subject of the book is treated by periods,—a method that has some advantages, and is to a certain extent necessary, but which has led to some repetition and diffuseness. The work is also encumbered with too much detail; the commercial and manufacturing operations, and even such matters as dress and equipage, being treated with a minute particularity which is wholly unnecessary, and wearisome to the reader. Facts in history are chiefly valuable as illustrating natural and moral laws, and in enabling us to mentally reconstruct the life of the past, and all details that are not needed for these purposes may better be dispensed with. Nor can we think Mr. Weeden altogether happy in his pictures of social life, his attention being too much fastened on the trifling matters of dress, manners, amusements, etc., and too little on the more important themes of morals and education. He gives a good deal of space to the sumptuary laws and other restrictive measures of the Puritans, but is not equally satisfactory in delineating the nobler elements of the Puritan character.

But though the book has in our eyes these defects, it is nevertheless a valuable work, and an addition to our historical and economical literature. It is written in a clear and simple style, which makes it at once more interesting and more easily understood than works of this kind often are. The author seems also to have taken great care in collecting his facts; town records, personal diaries, and merchants' accounts having been ransacked for the purpose, and often with good results. One of the strong points of the book is its treatment of political subjects in relation to economic life. The account of the settlement of the country and the beginnings of industry and commerce is one of the best parts of the work, and shows the working of both political and economical agencies in the formation of the new community. Again, in dealing with the navigation acts and other oppressive measures of the British Government, the author shows with much felicity their effect in injuring trade as well as in rousing the spirit of rebellion among the Colonists. Yet, though he has clearly grasped the economic bearings of political agencies, he has not allowed himself to be drawn off into political history itself, but has confined himself to his own proper theme. Mr. Weeden shows that the fisheries, in which the Massachusetts people always excelled, were the main foundation of New England commerce, agriculture being only a

means of subsistence, while beaver-skins, rum, and timber, all contributed to swell the merchants' cargoes. The rise and growth of manufactures receive due attention at all stages, and considerable space is devoted to the details of foreign trade. In the appendix there is a list of prices during each year of the period dealt with, while a very full index adds to the value of the book.

AMONG THE PUBLISHERS.

THE latest of the volumes treating of the "Famous Women of the French Court," translated from the French of Imbert de Saint-Armand by T. S. Perry, and issued by the Scribners, is entitled "Citizeness Bonaparte." It sketches the career of Josephine from the time of her marriage to the period of Napoleon's consulship, covering the most romantic and happy portion of her life; and includes the campaign in Italy, the expedition to Egypt, and Napoleon's subsequent personal success and triumph at Paris. The former volumes are entitled "The Wife of the First Consul," "The Happy Days of tho Empress Marie Louise," and "Marie Antoinette and the End of the Old Régime."

—*The Popular Science Monthly* for October will contain a further discussion of the fall of man and anthropology, by Dr. Andrew D. White, in which he reviews the futile efforts of Archbishop Whately and the Duke of Argyll to prove that the lowest races of men have sunk from an earlier civilization, and the equally successful attempts of certain church organizations in recent years to silence professors of science who were teaching the truths of evolution; a delightfully simple and practical talk to mothers about interesting children in the study of nature, by Mary Alling Aber, under the title "Mothers and Natural Science," in which the author points out the beneficial influence of scientific ideas on the formation of character, and tells how mothers may use the common things around them in teaching their children how to question Nature, and how to interpret her answers; "Liquor Laws not Sumptuary," by G. F. Magoun, D.D., being a reply to an article by Dr. William A. Hammond on sumptuary laws in an earlier number (Dr. Magoun quotes old colonial and recent State laws to show that existing statutes against the liquor traffic have not been made to enforce economy); and a copiously illustrated account of ancient dwellings of the Rio Verde valley, in Arizona, by Capt. Edgar A. Mearns, assistant surgeon, U.S.A., containing a description of ruined cliff-dwellings and pueblos explored by Dr. Mearns, with plans showing the exact arrangement of the rooms on the five floors of one of the former.

—Professor George T. Ladd of Yale University has just completed an important work entitled "Introduction to Philosophy," —a broad and comprehensive view of the whole field of philosophy. It will be published by the Scribners, who also have in preparation an abridgment of Professor Ladd's "Physiological Psychology."

—On Oct. 1 The Open Court Publishing Company of Chicago will begin the publication of a new quarterly magazine of philosophy, science, religion, and sociology, *The Monist.* The first number of this new magazine will contain articles by Professor E. D. Cope of Philadelphia, Professor George J. Romanes of London, M. Alfred Binet of Paris, Professor Ernst Mach of Prague, Max Dessoir of Berlin, and Dr. Paul Carus of Chicago. The foreign correspondence and the departments for the general review of foreign philosophical and scientific literature will be conducted, for Italy, by Professor C. Lombroso, the criminologist; for France, by Lucien Arréat, the critic of the *Revue Philosophique;* for the northern countries, by Professor Harald Höffding of Copenhagen; for Germany, by Professor F. Jodl of Prague, and others. Reviews of American and English books will appear separately. Articles will appear in *The Monist* by Professor Joseph Le Conte, Professor William James, Charles S. Peirce, Professor Max Müller, Professor Ernst Haeckel, and Th. Ribot. The magazine will be

Publications received at Editor's Office, Sept. 8-13.

BARDEEN, C. R. Home Exercise for Health and Cure. Tr. from German of D. G. R. Schreber, M.D. 23d ed. Syracuse, N.Y., C. W. Bardeen. 91 p. 16°.

FISKE, J. Civil Government in the United States considered with some Reference to its Origins. Boston and New York, Houghton, Mifflin, & Co. 360 p. 12°. $1.

GALLAGHER, G. W. One Man's Struggle. New York and London, Funk & Wagnalls. 169 p. 12°. $1.

GUYOT, A. The Earth and Man. Tr. by C. C. Felton, LL.D. Revised ed. New York, Scribner. 334 p. 12°. $1.75.

HARKNESS, A. An Easy Method for Beginners in Latin. New York, Cincinnati, and Chicago, Amer. Book Co. 348 p. 12°.

HOUSE and Pet Dogs; their Selection, Care and Training. New York, Forest and Stream Publ. Co. 115 p. 16°. 50 cents.

MACFARLANE, J. An American Geological Railway Guide. 2d ed. New York, Appleton. 426 p. 8°. $2.50.

MARTYN, C. Wendell Phillips: the Agitator. With an Appendix containing three of the orator's masterpieces never before published in book form. New York and London, Funk & Wagnalls. 600 p. 12°. $1.50.

OSTWALD, W. Outlines of General Chemistry. Tr. by James Walker. London and New York, Macmillan. 396 p. 8°. $3.50.

PREBLE, H., and PARKER, C. P. Handbook of Latin Writing. Revised ed. Boston, Ginn. 109 p. 12°. 55 cents.

PRUDDEN, T. M. Dust and its Dangers. New York and London, Putnam. 111 p. 16°. 75 cents.

SIDNEY, Sir Philip. The Defense of Poesy: Otherwise known as An Apology for Poetry. Ed. by A. S Cook. Boston, Ginn. 143 p. 12°.

SMITH, C. E. The World Lighted, a Study of the Apocalypse. New York and London, Funk & Wagnalls. 218 p. 12°. 75 cents.

WEEDEN, W. B. Economic and Social History of New England, 1620-1789. 2 vols. Boston and New York, Houghton, Mifflin, & Co. 964 p. 8°. $4.50.

WOODY, S. E. The Essentials of Medical Chemistry and Urinalysis. 3d ed. Philadelphia, Penn., Blakiston. 157 p. 12°.

ZABRISKIE, F. N. Horace Greeley, the Editor. (American Orators and Reformers.) New York and London, Funk & Wagnalls. 398 p. 12°. $1.50.

devoted to the establishment and illustration of the principles of monism in philosophy, exact science, religion, and sociology. So far as the fulfilment of this aim will allow, it will bear a popular character, publishing articles of general interest as well as those of a more special character.

—*The Chautauquan* for October offers among its table of contents, "The Intellectual Development of the English," by Edward A. Freeman; "The English Constitution," by Woodrow Wilson, Ph.D., LL.D.; "How the Saxons Lived," by R. S. Dix; "The Tenure of Land in England," by D. McG. Means; "An Early Briton," by J. Franklin Jameson, Ph.D.; "Studies in Astronomy," by Garrett P. Serviss; and "Scientific Expeditions from American Colleges," by N. S. Shaler, S.D. In this number is begun the publication of a special English course of reading, to extend throughout the year. All the contributors are eminent authorities in their respective departments of investigation.

— Messrs. Ginn & Co. announce to be published about Oct. 1, "Handbook of Historic Schools of Painting," by Miss Deristhe L. Hoyt, instructor in the Massachusetts Normal Art School. This book, the outgrowth of many years of lectures, gives in a concise and systematic manner the most important facts regarding the principal schools of painting (both ancient and modern), the most noteworthy masters, and the most celebrated pictures. It contains also descriptions of the different kinds of painting most practised from the earliest times, definitions of technical terms, a list of emblems employed by the painters of the fifteenth, sixteenth, and seventeenth centuries to denote the different saints and other characters in their devotional pictures, with an explanation of their symbolic use of colors (essential to an understanding of their works), and a pronouncing vocabulary of the names of all artists mentioned. The book has long been needed, and will be found most helpful by art students, by reading-clubs, and by all interested in art or related subjects.

— Herbert Laws Webb, who will contribute an article on "Life on Board a Cable Ship" to the October *Scribner*, is a son of F. C. Webb, C.E., who, in company with Cyrus W. Field, selected the landing place at Valentia for the first Atlantic cable. The article is founded on Mr. Webb's experiences as a member of the technical staff of the Silvertown Telegraph Company's steamer, which laid the cable from Spain to the Canary Islands. John W. Root, who writes "The City House in the West" for the same number, is the architect of the great business block in Chicago known as "The Rookery." In his article Mr. Root says, "It may be prophesied with certainty, that, as a result of the architectural movement now in progress, Western cities like Chicago, St. Louis, Kansas City, Minneapolis, Milwaukee, and many others, will within a short time present streets unrivalled in the world for the variety, picturesqueness, and beauty of their domestic architecture." Many typical houses from these cities will appear in the illustrations. Mrs. Sylvanus Reed, for twenty-six years the head of a famous private school for girls in New York, says (in the October number), "I took the college system for men, and eliminated from it studies the educational value of which were questioned by high authorities, and adapted it to the needs of women. Just now, when in these colleges woman has demonstrated that she can do in an examination just as much and as well as a young man, the great universities of England and America have discovered, what a quarter of a century ago I believed to be the case, that much of this preparation is a waste of time and energy." Robert Brewster Stanton, chief engineer of the party which last winter made a perilous survey for a railway through the entire length of the cañons of the Colorado, will describe the adventures of that journey in an early number of *Scribner's Magazine*. No party has ever before traversed these cañons except that of Major J. W. Powell in 1869, and Mr. Stanton's expedition is the first that has ever made a continuous trip along the waters of this river from its head to its mouth.

A lady in Columbia, S.C., who reared silkworms, being unable to obtain the leaves of the mulberry or Osage orange, made use of the leaves of the rhea-plant, which were eaten ravenously by the worms. When sent to Philadelphia, the cocoons were stated to be larger, and the silk finer, than was the case with those of worms fed on mulberry and Osage orange leaves.

CATARRH.

Catarrhal Deafness—Hay Fever.

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Sufferers are not generally aware that these diseases are contagious, or that they are due to the presence of living parasites in the lining membrane of the nose and eustachian tubes. Microscopic research, however, has proved this to be a fact, and the result of this discovery is that a simple remedy has been formulated whereby catarrh, catarrhal deafness and hay fever are permanently cured in from one to three simple applications made at home by the patient once in two weeks.

N.B.—This treatment is not a snuff or an ointment; both have been discarded by reputable physicians as injurious. A pamphlet explaining this new treatment is sent free on receipt of stamp to pay postage, by A. H. Dixon & Son, 337 and 339 West King Street. Toronto, Canada.—*Christian Advocate.*

Sufferers from Catarrhal troubles should carefully read the above.

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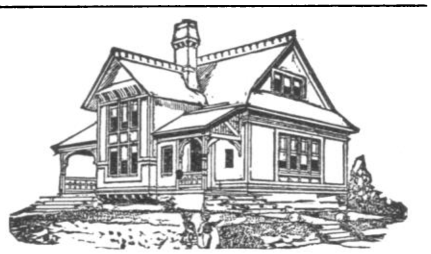

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